Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-41B-V-01	APU
	GMT: 34:13:15		SPR 11F009	UA	Manager:
			IPR	PR	
					Engineer:

Title: Auxiliary Power Unit Gas Generator Valve Module Water Cooling System A Failed Off. (ORB)

Summary: DISCUSSION: After APU (auxiliary power unit) shutdown following ascent, the primary water cooling system (A) for the APU fuel pump and GGVM (gas generator valve module) was activated on all three APU's. However, the system failed to provide adequate cooling water to any of the three fuel pumps, resulting in the fault detection and annunciation limit of 202 deg F being violated on all three APU's. Maximum fuel pump temperatures of 216, 218, and 222 deg F were reached on APU 's 1, 2, and 3, respectively. Partial and erratic cooling of the GGVM was observed in APU 1 and 3; however, none was detectable on APU 2. A switchover was made to the secondary water cooling system (B) at 37 minutes MET (about 22 minutes after APU shutdown) and proper cooling of all three APU's was observed.

The environment around the water cooling systems was well above freezing - approxiamtely 60 deg F prelaunch and on-orbit. The most probable cause of the lack of cooling water to the APU's from the primary water cooling system was malfunctioning (partially open) isolation valve. This type of failure restricts the water flow and reduces the system driving pressure. The pressure was only sufficient to open system check valve 1 and occasionally open check valve 3 (which corresponded to the erratic cooling observed on the GGVM's); but the pressure was not sufficient to open check valve 2 at all. The check valve cracking pressure is 2 psid. Contamination was the most likely cause of the primary water system isolation valve malfunctioning. Postflight testing has verified the acceptability of all components in the primary water system except the isolation valve. The valve is currently hung in the open position. Sustained power supplied to the valve during postflight testing probably drove the valve from a partially open to a full-open position. The valve was hung in the full-open position and is being removed and replaced with a spare. A failure analysis will be performed on the valve. CONCLUSION: The most probable cause of the lack of cooling to the APU's from the primary water system was a malfunctioning (partially open) isolation valve. This condition probably resulted from contamination. CORRECTIVE_ACTION: NONE. The failure analysis and closeout will be tracked by CAR 11F009. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-02	INS
	GMT: 34:13:02		**SPR** 11F001, 11F010, 11F007	**UA**	**Manager:**
				PR	
			IPR		**Engineer:**

Title: Instrumentation Failures. (ORB)

Summary: DISCUSSION: A. SSME GH2 pressurization outlet pressure sensor (V41P1260A) failed. The sensor failed "off scale high" at about T+164 seconds. This failure occurred on STS-6, 7, and 8. The problem is caused by a high vibration environment and will be resolved when a redesigned sensor mounting is installed along with the new design of the flow control valve. The sensor will be replaced prior to STS-41C.

B. APU 1 gas generator injector temperature (V46T0174A) read 600 deg F low. The temperature indication was erratic prelaunch and dropped 600 deg F low at about T + 2 minutes. The temperature was also erratic during entry. The measurement will be replaced with the new APU for STS-41C. Troubleshooting will continue at the APU vendor. C. APU 3 gas generator pressure (V46P0320A) read 100 psi high during ascent and entry. Although biased, data from the measurement was usable. The measurement will be replaced with the new APU for STS-41C and troubleshooting will continue at the APU vendor. CONCLUSION: See above. CORRECTIVE_ACTION: See above. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** RCATVA2765, RCATVA2548F	**IFA** STS-41B-V-03	C&T
	GMT: 34:14:45			**UA**	**Manager:**
			SPR	**PR**	
			IPR		**Engineer:**

Title: Payload Bay Television Camera D Did Not Tilt, Was Slow To Pan, And The Color Wheel Stuck. (GFE)

Summary: DISCUSSION: At 34:14:45 G.m.t., the crew reported that camera D did not tilt when commanded, the pan motion was very slow, and apparently there was no color wheel operation. During EVA 1 the camera and lens assembly were removed and returned to the cabin where they were replaced with a cabin camera and lens assembly. During EVA 2 the new camera and lens assembly were placed back in the payload bay. The color wheel operated satisfactorily, but the pan and tilt still did not work.

Postflight, the vendor determined that the camera color wheel assembly motor was inoperable. The rotor assembly was found to contain epoxy which had apparently flowed onto it from an attached cobalt sleeve that was found to be cracked. The cause of the cracked sleeve and the source of the heat that caused the epoxy to flow have yet to be determined. The pan and tilt problem was caused by a power supply transistor that was shorted. Two screws that mounted a heat sink for the transistor had not been cut to the proper length after installation and they rubbed the conformal coating off a capacitor on the facing board causing the transistor to open. Documentation does not require that these screws be cut off but the assembly technicians are aware that this is a required operation. To preclude this happening again, assembly procedures will be revised to indicate the correct screw length. Also, all pan and tilt assemblies in the program will be inspected to assure that this condition does not exist on any other units to be flown after STS-41C. All pan and tilt assemblies on STS-41C have been successfully flown on previous flights. CONCLUSION: The color wheel on camera D failed because a cobalt sleeve cracked and epoxy flowed onto the rotor assembly causing it to bind. Causes of the crack and the epoxy flow have yet to be determined. The D camera pan and tilt assembly failed because two screws were not cut off at assembly, thus causing the power supply transistor to open, shorting the power to the pan and tilt assembly. CORRECTIVE_ACTION: The color wheel problem will be analyzed and tracked on FIAR RCATVA2765. All pan and tilt assemblies for STS-41D and subsequent flights will be examined by the vendor to assure that correct length screws are used. Vendor procedures will be changed to reflect the correct length for these screws on future assemblies. Analysis and corrective action will be tracked on FIAR RCATVA2548F for the pan and tilt assembly problems. FIAR ANALYSIS: Failure analysis revealed that the cobalt sleeve on the rotor of the color wheel motor had fractured. This is a GFE item. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	**Time**	**Classification**	**Documentation**		**Subsystem**
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-04	Water and Waste Management System
	GMT: 34:16:22		**SPR** 11F002	**UA**	
			IPR	**PR**	**Manager:**
					Engineer:

Title: Waste Collection System Fan Separator Number 1 Did Not Spin Up To Full Speed And Later The Slinger Circuit Breaker Opened. (ORB)

Summary: DISCUSSION: At about 034:15:22 G.m.t., during the second operation of the WCS (waste collection system), the fan separator number 1 did not spin up to full speed, became flooded, and stall currents were observed on all 3 phases of AC bus 1. The crew switched from fan separator number 1 to fan separator number 2 and operation was normal for the remainder of the mission.

At 039:17:10 G.m.t. the WCS control/slinger CB (circuit breaker) opened. Fecal material had frozen between the slinger and the transport tube. A short crowbar was used to clear the obstruction. During postflight tests at KSC, fan separator number 1 sounded as if it was running at about half speed, urinal air flow was 4.45 cubic feet per minute (nomral is 9-10 cubic feet per minute) and the current was 2.2 to 2.3 amperes (normal is 1 ampere). An odor of urine filled the area indicating that stale urine was still flooding the separator. A second test was performed with the pressure on the waste water tank reduced to ambient, and the separator returned to normal speed with a constant 1 ampere current. Apparently, the reduced backpressure allowed the fan separator to clear itself of the flooded condition. The WCS was removed and returned to

the vendor. Tests, including pin-to-pin continuity, control switch verification, and thermal cycling, failed to identify a faulty component. Preflight and flight data indicate momentary dropouts of electrical power to the fan separator. Vendor tests have shown that a 2-3 second power interruption when pumping liquid/urine causes the fan separator to remain in a stall current condition. CONCLUSION: The cause of the fan separator number 1 failure to spin up to normal speed is unknown. A possible cause could be an intermittent electrical component, such as a limit switch, which could have interrupted power. The slinger circuit breaker opened because the slinger motor overloaded due to material between the slinger and the transport tube. CORRECTIVE_ACTION: A flooded fan separator may be cleared by opening the waste water dump and dump isolation valves while keeping the waste water tank isolated. Future failure analysis of WCS components will be tracked by CAR 11F002. The length of the transport tube has been shortened, effective on STS-41C, to preclude collection of material between the slinger and the transport tube.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	**Time**	**Classification**	**Documentation**		**Subsystem**
MER - 0	**MET:**	Problem	**FIAR** EE-0577F	**IFA** STS-41B-V-05	C&T
	GMT: 34:21:00		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Intercom Voice Loop Noise. (GFE)

Summary: DISCUSSION: At about 034:22:26 G.m.t., the crew reported that they were experiencing noise on the communications loop when using the WCCU's (wireless crew communications units). The first WCCU E wall unit was found to be microphonic and was stowed. The second WCCU E wall unit was noisy. A second E leg unit was tried but the noise was still present. The WCCU E wall unit was used with the middeck ATU (audio terminal unit). All switches at the middeck ATU were turned off but the noise was still present. The crew tried turning off all WCCU wall units individually, but this did not help the problem. Also noise was experienced on the WCCU B unit. The noise seemed to come and go and did not appear to be related to crew movement.

An extender cable was attached between the middeck ATU and the WCCU E wall unit. The noise was still present when the WCCU E wall unit was moved to the flight deck. The crew then plugged the WCCU E wall unit into the MHA (multiple headset adapter) at the pilot's station and the noise was not evident. The crew did not experience noisy communications when using the hardwired HIU's (headset interface units) when WCCU walls were not in use. Postflight, the wireless units were returned to JSC for testing. The first WCCU E wall unit was verified to be microphonic. The other wireless units performed normally. Since the on-orbit vehicle systems configuration in which the noise is experienced cannot be totally duplicated on the ground, and since noise was not experienced when using the HIU's, it was decided that special troubleshooting on the vehicle at KSC would not be fruitful. An inflight troubleshooting procedure will be available for STS-41C. The use of the WCCU's are not mandatory for mission operations. The source of the noise that has been experienced with these units has not been established. CONCLUSION: The WCCU's as presently designed are susceptible to EMI (electromagnetic interference). The cause of noise that has been experienced is unknown. CORRECTIVE_ACTION: An inflight troubleshooting plan is being developed to assist the crew in isolating the noise problem should it recur on STS-41C. FIAR ANALYSIS: WCCU's are GFE to the Orbiter. Failure analysis and other references to the flight anomaly are contained in FIAR EE-0577F. [not included in original problem report]

EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-41B-V-06	RCS
	GMT: Prelaunch		**SPR** AC6471F	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Aft RCS Fuel Primary Regulator A Internal Leak. (ORB)

Summary: DISCUSSION: The LRCS (left reaction control subsystem) fuel-side regulator A leaked through the primary stage during pre-launch operations at an approximate rate of 39,000 scch. A waiver was approved for excessive primary stage leakage during helium loading (OMRSD requirement is 150 scch/regulator). The leakage on the launch pad stopped at the secondary lock-up pressure which is approximately 264 psia.

The LRCS fuel-side regulator A worked in the proper pressure range during mission usage, but the pressure increased slowly to the secondary lock-up level during period of no usage. The most probable cause of the regulator leakage is particulate contamination which affected the poppet seals. The OV-099 left-hand pod is being removed prior to STS-41C because of TPS (thermal protection system) damage. The pod will be replaced with the left-hand pod from OV-103. Redundancy in the RCS helium system pressure regulation exists from regulators (primary and secondary) that are in series in each of the two selectable parallel paths (leg A or B). In addition, the helium isolation valve can be manually controlled to isolate any leakage. CONCLUSION: The LRCS fuel primary regulator A exhibited a slow internal leak that most likely resulted from particulate contamination. CORRECTIVE_ACTION: NONE. Analysis and problem closeouts will be trakced by CAR AC6471F. CAR ANALYSIS: PR203 s/n 050 was removed post-flight and subjected to failure analysis. Both primary and secondary main and pilot seats, poppet/ball assemblies were contaminated as was the internal gas ducting. (See CAR AC6471-010 for further details). [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-07	OMS
	GMT: 036:10:23		**SPR** 11F004	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Left OMS Oxidizer Tank Aft And Total Quantity Gaging Systems Failed. (ORB)

Summary: DISCUSSION: During the OMS (orbital maneuvering system) 4 (recircularization) maneuver, the left OMS oxidizer quantity gaging system apparently failed. The total and aft quantities dropped suddenly from their normal values of 4.4 per cent and 0.7 per cent respectively. During a subsequent maneuver, the total quantity counted down from 1.4 per cent to 0 per cent and then read off-scale high. The aft quantity remained at 0.4 per cent during the maneuver. The loss of the gaging system had no flight impact.

Although quantity gaging failures have occurred on previous flights, this is the first failure that has been experienced on both the total and aft quantities. Testing at KSC has not found the problem in the totalizer, the probe electronics, or the quantity probe. CONCLUSION: Testing at KSC has not isolated the source of the quantity gaging failure. CORRECTIVE_ACTION: The Left OMS pod on OV-099 has been replaced with the OV-103 OMS pod that contains a new quantity gaging system. Troubleshooting will continue at KSC and this problem will be tracked on CAR 11F004. The propellant gage will be repaired or replaced prior to the next use of the OV-099 pod. CAR ANALYSIS: Failure isolated to broken wire in cable 51V77W4 near P714. Separated wire was held in place by wire insulation resulting in intermittent signal. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** HEN0039F	**IFA** STS-41B-V-08	GFE
	GMT: 36:11:51		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Integrated Rendezvous Target Failed. (GFE)

Summary: DISCUSSION: Upon deployment of the IRT (Integrated Rendezvous Target) balloon device from the base assembly, the stave cable cutter sequence did not initiate because the lanyard connection failed. This prevented release of the staves enclosing the balloon. The inflation sequence did initiate and the balloon began to inflate inside the staves assembly. Pressure continued to build up in the balloon until the stave cable parted, followed by a violent expulsion and destruction of the balloon.

Examination of the failed stave cable cutter lanyard was made on return of the Orbiter to KSC. The analysis indicated that an improper crimp connection fabricated during assembly had caused the lanyard connection to fail open. CONCLUSION: An improper crimp connection failed, allowing the lanyard connection to fail open. CORRECTIVE_ACTION: A different and more positive lanyard-connection method will be used if the IRT is required for future use. Manufacturing records will be reviewed to determine the cause of the improper lanyard connection, and this problem will be tracked on FIAR HEN0039F. FIAR ANALYSIS: A review of manufacturing records indicate that the improper crimping tool was used for the type of ferrule used. Tighter quality control will be applied if the IRT is flown again. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE. The IRT is not scheduled for use on future flights.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-09	CREW
	GMT: 35:19:49		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Extravehicular Mobility Unit 2 Light Protective Lens Cracked. ()

Summary: DISCUSSION: The protective lens for the light on EMU (Extravehicular Mobility Unit) 2 was found cracked when it was unstowed on orbit. The lens is mounted on the helmet and is not an environmental seal. Also the light operated normally for both EVA's (Extravehicular Activities).

Both EMU lights were stowed in volume H with the lenses resting against each other. The protective lens was probably cracked after stowage during transportation from JSC-to-KSC or during launch from the associated vibration. Protective stowage padding has been added between the lenses of the EMU lights for STS-41C and subsequent flights. CONCLUSION: The protective lens for the light on EMU-2 was probably cracked during transportation or launch. The light operated normally for both EVA's.
CORRECTIVE_ACTION: Padding has been added to protect the lenses of the EMU lights after stowage for STS-41C and subsequent flights.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-10	C&T - Ku-band
	GMT: 36:21:38		**SPR** 11F003	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: KU-Band RF Power Output Went to Zero. (ORB)

Summary: DISCUSSION: At 036:23:08 G.m.t., the KU-Band RF power was observed to be zero. Data revealed that the "operate" bit was "low" and the RF power output was zero at 036:21:38:07 G.m.t. during the previous pass. The system power was cycled from "on" to "standby" and then back to "on" with negative results. After the crew sleep period, the system power was switched from "on" to "off", and then back to "on". The RF power output was recovered and it remained nominal for the remainder of the mission.

Circuit analysis of the DEA (deployed electronics assembly) shows that the TWTA (traveling wave tube assembly) can be turned off by internal fault sensing logic or by an electrical system transient. Future system analysis and data collection will continue in an effort to establish if the observed condition is caused by fault sensor triggered thresholds being too sensitive or by some electrical transient condition which upset the fault detection logic. Since the observed RF output failure can be corrected in flight by cycling the KU-Band power, the problem is manageable and will be flown as is for STS-41C. Should the KU-Band be lost during a crew sleep period, the HDR (high data rate) and the HDR dump (required for solar maximum computer memory verification) through TDRSS (Tracking Data Relay Satellite System) will be lost unless the crew is awakened. CONCLUSION: The loss of the KU-Band RF power output was most probably caused by overly sensitive fault sensor thresholds or by some electrical transient condition that upset the fault detection logic. If the same problem occurs during the STS-41C mission, then the KU-Band power cycling procedures will be implemented. CORRECTIVE_ACTION: Data collection and system analysis will continue in an effort to fully understand the nature of the problem. The results of this activity will be tracked via CAR 11F003. CAR ANALYSIS: Unable to duplicate problem (as stated) during analysis at vendor. Two possible explanations exist, neither of which is flight critical since the problem is immediately identifiable and is cleared with a power cycle. However, investigation is in work to determine what inhibits TWT turn-on logic (sometimes). [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: If the KU-Band RF output goes to zero during a crew sleep period, then HDR and HDR dump capability through TDRSS will be lost unless the crew is awakened.

Tracking No	**Time**	**Classification**		**Documentation**	**Subsystem**
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-11	GNC
	GMT: 35:06:08		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: GN&C Downlist Data Incorrect In Low Data Rate. (ORB)

Summary: DISCUSSION: At about 035:06:08 G.m.t., it was observed that the last 8 bits of the GN&C (Guidance, Navigation, and Control) LDR (low data rate) downlist in both TFL (telemetry format load) 103 and TFL 106 were being corrupted intermittently. These last 8 bits were not being corrupted when the HDR (high data rate) TFL's were being used. The affected downlist measurements were identified. It was established that these measurements would not be a constraint to any STS-41B flight operations.

There is a known potential for the occurrence of this anomaly due to generic GPC/PCMMU (general purpose computer/pulse coded modulation master unit) system timing relationships. During the STS-41B mission, the LDR formatter in the PCMMU lagged the HDR formatter read cycle by one half word. This resulted in the HDR formatter completing its read cycle and thus causing a toggle of the PCMMU toggle buffer before the LDR formatter could complete the read of its last half word (8 bits). The last 8 bits of the LDR data was thus lost. For this to happen, two key factors had to be present. First, the GN&C write EOM (end of message) moved into the GN&C window of the PCMMU read cycle. Secondly, the PCMMU read cycle moved ahead of the GPC GN&C downlist write cycles. The EOM moved into the GN&C window due to the original pseudo synchronization placement and/or to the GPC jitter. The PCMMU moved ahead of the GN&C downlist write cycles by activating TFL 129 hard format (normal operations when changing TFL's) when the G2 (on-orbit operations) downlist format was inputting 44.8 kbps (kilobits per second) into a 51.2 kbps hard format downlink window. That is, putting a small downlist into a larger downlink window. The intermittent anomaly was caused by PCMMU internal priority processing and/or GPC jitter. The SM (system management) LDR downlist format was not affected by this phenomena since the SM downlist matched its downlink window and the EOM was not moved into the SM window of the PCMMU read cycle. Similarly, the VU (vehicle utility) and BFS (backup flight control system) downlist were not affected since their formats (both soft and hard) matched their downlink windows. The relative position of the EOM will stay as stated above unless the PCMMU is cycled to off, then to on, and/or the alternate PCMMU is selected. Conducting either of these procedures will move the EOM. A listing of measurements for STS-41C that can be affected by the above LDR downlist problem has been identified and has been verified as not being a constraint to STS-41C flight operations. CONCLUSION: The corruption of the last 8 bits of the PCMMU LDR downlist is caused by a generic GPC/PCMMU timing relationship. The affected measurements did not cause constraints to STS-41B flight operations. CORRECTIVE_ACTION: A listing of measurements that can be corrupted in the LDR downlist will be generated for all future flights. There is at present no known constraints to any future flight operations. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-12	RCS
	GMT: 38:11:49		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: RCS Thruster R3A Jet Driver Output Discrete Failed. (ORB)

Summary: DISCUSSION: Prelaunch checks at KSC could not verify that the R3A driver discrete was operating. This failed function prevented the redundancy management system from detecting a failed "ON" thruster. Because a failed "ON" thruster is extremely unlikely, the nonverified function was an acceptable risk for flight.

Prior to EVA when this thruster was hot fired, the driver discrete was verified failed and the driver was turned "OFF" during periods when it was not required for attitude control. Postflight troubleshooting found a recessed pin in a connector in the thruster driver discrete circuit. CONCLUSION: The problem was the result of a recessed pin in a connector in the thruster driver discrete circuit. The pin was most probably not properly seated in the connector and was pushed back when the connector was mated. CORRECTIVE_ACTION: The connector pin has been properly seated and the circuit retested successfully. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-13	Water and Waste Management System
	GMT: 39:08:48		**SPR** 11F017	**UA**	
			IPR	**PR**	**Manager:**
					Engineer:

Title: Supply Water Dump Valve Failed to Open. (ORB)

Summary: DISCUSSION: ON the ninth attempted water dump at 115 hours MET (mission elapsed time) the supply-water dump value failed to open. Repeated attempts to thaw the apparently frozen system were unsuccessful. Throughout the remainder of the mision, the level of supply water was successfully managed through the FES (flas evaperator system).

A chronology of events concerning this problem follows: The first six supply-water dumps were completed normally. The dump procedures (isolation valve open, dump valve controlling dumps) used throughout STS-41B were the same as those used successfully during the last portion of STS-8 and all of STS-9. The seventh dump, a dual waste- and supply-water dump, was the largest cotinuous dual dump ever made on any mission. The total quantity of waste and potable water dumped was 7 percent greater than any previous dump. During this dump, the supply-nozzle temperature profile indicated ice forming around the nozzles. The waste dump, becaue of its magnitude, extended beyond the supply dump by 27 minutes. This has not occured on any previous dual dump. After the dual dump the local bondline (V34T1102) temperature dropped from 20 deg F to 0 deg F, indicating local ice. During the eighth dump at 103 hours MET, a supply-only dump, the supply-nozzle temperature again indicated a possible freezing condition with difficulty in the supply-nozzle heater warmup and a colder dump-flow temperature (55 deg F versus 80-100 deg F) than expected. The waste-nozzle temperature profile also indicated ice buildup, and after the dump, the supply-line heater duty cycle also increased, which indicated an icing condition. When the ninth dump was attempted at 115 hours MET, the supply-dump nozzle again displayed warmup difficulty and the supply-dump valve did not open. Repeated attempts to thaw the ice by heating the dump nozzle to temperatures as high as 350 deg F were un successful. At 136 hours MET, the supply-dump valve was successfully opened, but a supply dump was still unsuccessful. The supply-dump valve was left open for a periodof approximately 26 hours. During this time period, after one rev of port-side sun, the waste water was successfully dumped. The waste nozzle response to the waste-water dump was a very rapid decrease in temperature. The potable-nozzle temperature followed the same rapid declining profile. The temperature of the waste nozzle dropped to about 50 deg F and remained there during the dump. The 50 deg F temperature is an indication of ice. The next supply-nozzle heater warmup occurred at 151 hours after 2 revs of port-side sun (to which neither supply or waste nozzles responded). During the warmup, the supply-nozzle temperature had severe difficulty in breaking the 50 degree F barrier. Since the supply-dump valve was open, the nozzle heater was probably trying to sunlime the water in the supply line. A final attempt to dump the supply water system occured at 162.5 hours MET after the nozzzle was heated to 300 deg F. The dump did not occur, and the supply-dump valve was closed. At 168 hours MET, the supply-line temperature dropped suddenly from about 90 deg F to 27 deg F and slowly recovered to 90 deg F. During entry, after the onset of entry heating, both dump-nozzle temperature profiles indicated that the ice built up on the nozzles broke loose at an altitude of approximately 123,000 feet (see problem STS-41B-27). Postflight inspection showed that the supply line had ruptured approximately 4 inches upstream of the supply-dump valve. Insulation was missing from the lower body of both dump valves and the RTV sealing was missing between both dump nozzles and the surrounding structure. An extensive data review, that concentrated on dual dump operations on STS-1, -4, -7, and -9, has resulted in the following probable scenerio of the freezing conditions experienced on STS-41B. During the long duration dual supply- and waste-water dump, water was frozen around the dump nozzles. The subsequent supply dump, although successful, aggravated the condition by placing additional ice deposits on the dump nozzles. The latent heat of sublimation of the deposited ice caused a cooldown of the dump nozzles, the attached dump lines, and the surrounding structure. This condition, coupled with the missing valve insulation and the fact that the supply-dump valve is located closer to the structure than the waste valve, resulted in freezin ght the supply line near the dump valve. Once ice had formed, the heat supplied by the nozzle and line heaters was not sufficient to overcome the inertia of the sublimation-cooling effects and the dump line remained frozen. This finally resulted in a hydraulic lock-up that ruptured the supply water dump line. Additionally, a review of data from waste-water dumps on STS-1, 4, 7, 8, 9, and 11 shows that during dumps of less than 50 percent minimal ice formation on the waste nozzle was probable. This condition is believed to be caused by the two-stage nozzle flow which exists because of the relatively large quantity of gas entrained in the waste-water and the fact that the waste-water dump pressure is lower than the supply-water pressure

(10 psia vs 14 psia) due to a debris filter in the waste system. The waste-water nozzle inlet pressure was 10 psia on STS-41B which is the lowest for any flight becaue of the debris filter and the fact that this dump occured at 10.2 psia cabin pressure. CONCLUSIONS: The waste water dumps deposited ice on the side of the vehicle. The ice propagated into the supply-water dump line and froze the dump valve, which eventually resulted in a hydraulic lock-up that ruptured the supply-water dump line. CORRECTIVE ACTION: The ruptured supply-water dump line has been replaced. The missing insulation on both dump valves has been replaced and the RTV sealant has been added. Dual waste and supply dumps will not be performed on future missions. During future dumps, the dump nozzle temperatures will be above 200 deg F (previously 100 deg F) before the dump valves are opened. Dumps will be terminated by closing the dump valve followed by enabling both supply- and waste-nozzle heaters until the nozzles temperatures exceed 200 deg F. For STS-41C a 43 percent waste dump is planned after LDEF operations, followed by viewing of the waste nozzle with the RMS to determine if icing conditions exist on the waste nozzle or surrounding tile. After completion of primary RMS usage, an additional smaller dump is planned with RMS viewing of the dump in progress. Normal potable water dumps will be done with mission constraints. The STS-41C analysis will determine if additional system changes are necessary. This failure will be tracked on CAR 11F017. EFFECTS ON SUBSEQUENT MISSIONS: None

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Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-13A	Water and Waste Management System
	GMT: 39:08:48		**SPR**	**UA**	**Manager:**
			IPR	**PR**	**Engineer:**

Title: Supply Water Dump Valve Failed To Open. (ORB)

Summary: DISCUSSION: An excessive amount of ice formed around the water-dump nozzles during an STS 41-B dual supply and waste-water dump. As a result of entry heating, the ice broke free and caused structural damage where it impacted the OMS pod. Also, the freezing conditions ruptured a water line, and insulation on the dump valves was found missing during the postflight inspection. The insulation was replaced, the water line was repaired, and modified dump procedures were used for STS 41-C.

RMS (remote manipulator system)-mounted cameras were used to view several waste-water dumps oon STS 41-C. The first observation was 30 minutes after a waste-water dump of 50-percent had been made. Minor icing was observed on the waste water nozzle in an area about 2.5 inches in diameter and approximately 1 inch thich. Ice also formed on the surrounding tile in a 6-inch square area approximately 1/4-inch thick. The second viewing was during and after a waste-water dump of approximately 15 percent. Minor icing (1/4-inch thick) was observed in a 2.5 inch diameter area on the waste-dump nozzle.   CONCLUSION: Minor ice formation is a normal result of waste-water dumps. The new dump procedures implemented on STS 41-C were effective in controlling the formation of excessive ice and these procedures will continue to be used. Sublimation will elminate minor ice buildup prior to entry.   CORRECTIVE_ACTION: NONE.   EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-14	RCS
	GMT: 37:10:00		**SPR** 11F013	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: FRCS F3D Heater Thermostat Set Point Shifted. (ORB)

Summary: DISCUSSION: The FRCS F3D heater thermostat set point shifted at approximately 56 hours MET. The RCS primary thruster fuel and oxidizer injector temperature response to thruster heater operation typically cycles between 75 deg F and 95 deg F with a period of 2 to 3 hours. This is in the absence of thruster firings. FRCS F3D injector temperatures cycled between approximately 64 deg F and 68 deg F with a period of 0.5 hour.

Postflight testing has verified both the shift in the thermostat set point and the cycle period observed during the mission. Heater control is provided by a solid-state controller. A review of the flight data and postflight testing results indicates that the most probable cause of the FRCS F3D thruster heater set point shift was a failure of the solid-state controller. The flight data have beens ent to the vendor for evaluation of the health of the FRCS F3D heater controller to to determine if a life expectancy time interval can be established. Mission rule 6-11 defines thruster injector heater failure as being when both the fuel and oxidizer injector temperatures exhibit a gradual cooling to less than 50 deg F. The concern for the 50 deg F limit is due to a potential for cold leakage. Should such a failure occur, mission rule 6-55 allows a thruster with a failed heater to be hot-fired periodically to maintain acceptable injector temperature (above 50 deg F). This type of system mission management was demonstrated during the STS-5 mission. A failed thruster heater requires that the engine be hot fired to maintain the 50 deg F lower limit. The thruster was periodically fired without interruption of crew sleep cycles. It is believed that periodic firings (every 8 to 12 hours) required as a result of failed heaters will cause no mission impact. CONCLUSION: The most probable cause of the FRCS F3D heater thermostat set point shift was an internal failure of the solid-state controller. The heater controller is functioning above the 50 deg F cold leakage temperature limitation. Periodic thruster hot firings can maintain acceptable temperature limits during mission operations, should a heater failure occur. CORRECTIVE_ACTION: NONE. Fly FRCS F3D as is for STS-41C. Analysis and problem closeout will be tracked by CAR 11F013. CAR ANALYSIS: The vendor has isolated the problem to changes in the temperature/resistance scaled output of the heater/sensor assembly. Cause of the deviations was a fracture in the .00007 dia. sensor wire, held together by surrounding material. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-15	STR
	GMT: 35:21:17		**SPR** 11F012	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: Storage Door MD23R Difficult To Open, Waste Collection System Door Did Not Latch, and Access Door To Inertial Measurement Unit Fan Filter Was Hard To Close. (ORB)

Summary: DISCUSSION: The crew reported that it was difficult to open the Volume H door (MD23R) to gain access to the Extravehicular Activity (EVA) equipment. A hammer and pry bar were used to open this door. The door was also difficult to close as it was skewed in the opening, overlapping one corner by 1/8 in. This door supports two of the four legs of the Mission Specialist seat for entry. Consequently, the crew were given procedures for alternate entry seat locations.

The crew reported that the Waste Collection System (WCS) door could not be latched because of a 1/2-in. gap between the door edge and the jamb that prevented the latch bolt from engaging the striker plate. For entry, the crew secured the door with gray tape. The access door to the inertial measurement unit fan filter was also very difficult to close. This same problem was found by the crew before flight. The panel is secured with two Allen-head screws, but the nut plate did not align with the screws. Inflight, two crew members were required to close the door - one using a pry bar to move the door and the other trying to start the screws in the nut plate. Consequently, after subsequent openings of this access door, the crew taped it shut to save time. The Volume G access door was found open when the crew started their on-orbit activities, and was left open throughout the flight. The crew also reported that almost all locker doors were very difficult to close, often requiring three crew members to close one locker door. Closure problems with the locker doors, WCS door, and stowage area doors have been reported by all crews on all flights of OV-099, and similar problems, but of less magnitude, have been reported on flights of OV-102. The crews, after STS-6, began taking measurements of gaps between lockers, doors, and jambs, and covers and frames to determine the magnitude of the problem. The basic cause of the problem is cabin deflections which increased after OV-102 as a result of weight reductions. CONCLUSION: The door, locker, hatch and access panel problems are the result of cabin deflections increased as a result of weight reductions in the OV-099 vehicle. CORRECTIVE_ACTION: There are four proposed modifications implemented on three lockers that have been defined as potential solutions to the locker door problem. Each of these configurations will be flown on 41D and the crew will evaluate them. After the flight evaluations are complete, the best option will be baselined and retrofitted on the flight vehicles. Fixes for the door, hatch and access panel problems are still being evaluated. CAR ANALYSIS: Design changes have been proposed by MCR 10903. The MCR has yet to be approved. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: Flight crews will be required to spend additional time and effort to close lockers and doors.

Tracking No	Time	Classification	Documentation			Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-16		HYD
	GMT: 37:22:36		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Power Drive Unit Rudder Speed Brake System 3 Secondary Switching Valve Indication (V58X1001E) Failed. (ORB)

Summary: DISCUSSION: The R/SB (rudder/speedbrake) switching valve responded properly when the hydraulic system 3 circulation pump was activated to open the landing gear isolation valve in preparation for on-orbit thermal conditioning. However, when the landing gear isolation valve opened, the added flow requirement caused the circulation pump pressure to drop from 189 psi to 168 psi. At that point, the R/SB second standby valve position transducer indicated a switch back to the active position. The valve remained in the active position throughout all subsequent system 3 circulation pump thermal control operations despite indicated pressures of up to 230 psi. Prior to the on-orbit FCS (flight control system) checkout, the system 3 circulation pump was again operated to close the landing gear isolation valve. When the valve closed, the increased pressure apparently caused the valve to respond properly to the second standby position; however, the valve improperly remained in the standby position after the pump was shutdown. When system 1 APU 1 was started for FCS checkout, the valve returned to its proper (active) position.

The R/SB switching valve specification requires the valve to change at a differential pressure of no greater than 150 psi. An analysis was conducted that indicates that a pressure drop of approximately 30 psi exists from the circulation pump to the PDU (power drive unit). The pressure drop can be larger based on the variation of average line temperature. The pressure available at the switching valve is established by reducing the circulation pump outlet pressure by the line pressure drop. A greater pressure loss reduces the pressure differential across the switching valve during circulation pump operation; therefore, the pressure differential may not have been sufficient to switch the valve. Postflight tests verified that the valve switched to the standby sytem at the proper increasing standby pressure and switched back to active at the proper decreasing standby pressure. CONCLUSION: During second standby circulation pump operation, the differential pressure at the switching valve was marginal with respect to valve switching. The line pressure loss at low temperatures combined with the system flow distribution during circulation pump operation was sufficient to reduce the differential pressure at the switching valve to a value lower than the switching point. The switching valve functions normally during main pump operation.
CORRECTIVE_ACTION: NONE. Fly STS-41C with existing rudder/speedbrake switching valve. Monitor system performance.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-17	RCS
	GMT: 39:21:36		**SPR** 11F011	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: The Right RCS Vernier Thrusters R5R and R5D Failed Off. (ORB)

Summary: DISCUSSION: The RJDA-2 (Reaction Jet Driver Assembly) driver power became intermittent during day 6. This caused the right RCS vernier thrusters R5R and R5D to fail off when they were commanded to fire at 039:21:36 G.m.t. A subsequent attempt to fire the thrusters at 040:10:56 G.m.t. also resulted in a failed-off condition. The thrusters were deselected for the remainder of the flight, thus requiring the use of primary thrusters to maintain vehicle attitude.

Postflight troubleshooting revealed a failure in the driver output circuit of ALCA (aft load control assembly)-2. The unit has been removed, replaced, and returned to the vendor for failure analysis. CONCLUSION: The loss of R5R and R5D vernier thrusters was caused by a failure of the driver output power circuit in ALCA-2. CORRECTIVE_ACTION: The failed ALCA-2 has been removed, replaced, and returned to the vendor for analysis. The results of this activity will be tracked via CAR 11F011. CAR ANALYSIS: Vendor failure analysis isolated the failure to the Hybrid Driver (U1). The Driver was removed and the failure was further isolated to a quad comparator chip (Z1). Failure history of the device was investigated and this was determined to be a random failure. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** RMS 1317F	**IFA** STS-41B-V-18	RMS
	GMT: 40:09:23		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Remote Manipulator System Wrist Yaw Joint Failed In Primary, And End Effector Thermal Blanket Damaged. (RMS)

Summary: DISCUSSION: 1. The wrist yaw joint of the RMS (remote manipulator system) failed to respond to commands at the beginning of EVA-2. At the time of the failure, the BITE (built-in test equipment) circuitry indicated a fault in the digital codes which provide the motor armature position to the power switching network of the brushless motor. The RMS was stowed for the remainder of the mission.

The problem could not be duplicated during extensive trouble-shooting at KSC. The RMS was removed from the vehicle and the wrist joint and motor module were sent to the vendor for further evaluation. At the vendor, some minor corrosion was found on the motor module connector. The wrist joint and motor module have gone through vibration and thermal vacuum testing and the problem could not be repeated. Analysis of the corrosion and teardown of the components will continue. 2. The crew reported that during EVA-1, a tool was accidentally pushed into the RMS end effector thermal blanket. CONCLUSION: 1. The cause of the wrist joint failure is unknown. Should this problem recur the RMS can be stowed in the manual mode. The replacement arm is the newest hardware and has been properly verified for STS-41C. 2. The end effector insulation was accidentally damaged by the crew and will be repaired. CORRECTIVE_ACTION: 1. The serial number 201 RMS arm flown on STS-41B has been replaced with the serial number 302 arm. Detailed evaluation will continue at the vendor and results will be tracked on FIAR RMS 1317F. 2. The end effector thermal blanket will be repaired prior to the next use of the serial number 201 RMS arm. FIAR ANALYSIS: Unable to duplicate failure at vendor. Unable to identify most probable cause after tearing down most probable component(s) candidate(s). [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** EE0576F	**IFA** STS-41B-V-19	CREW

GMT: 40:10:56 **SPR** **UA** **Manager:**

IPR **PR**

Engineer:

Title: EMU TV Failed. (GFE)

Summary: DISCUSSION: The EMU TV failed to operate at the start of the second EVA. The green power-on indicator light failed to come on even after repeated switch activations by the EMU-1 crewman. Postflight evaluation found that the battery fuse was intact but that one of 8 cells had zero voltage.

The low-voltage safety cut off system is inactive for the first minute of operation after a battery pack is installed. If the camera had been operated for more than a minute during the pre-EVA checkout procedure, then the failed battery would have been detected. Additionally, a review of the preflight acceptance vibration test data indicated that a problem existed but was not recognized. The failed battery has been removed, replaced, and returned to the manufacturer for futher failure analysis. CONCLUSION: The EMU TV failed to operate during EVA 2 due to a failed cell in the battery. CORRECTIVE_ACTION: The battery has been removed and replaced. Results of the failure analysis at the manufacturer will be tracked on FIAR EE0576F. Acceptance vibration test criteria will be changed to reject any battery with a deviation in open circuit voltage (OCV) of more than 0.1 OCV. A load voltage test is now performed upon completion of electrical assembly. An additional load voltage check will be made at pre-installation acceptance (PIA). Crew procedures for pre-EVA checkout have been changed to operate the EMU TV camera for more than 1 minute. FIAR ANALYSIS: Postflight testing determined that the EMU-TV did not fail. The problem was the Li-BCX EMU-TV battery. Subsequent examination showed that one cell exhibited variable open circuit voltage. Failure analysis showed that the negative lead from the cell element to the cell can was broken. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** RCATVA2549F	**IFA** STS-41B-V-20	C&T
	GMT: 40:14:07		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Remote Manipulator System Elbow Television Camera Failed. (GFE)

Summary: DISCUSSION: At approximately 40:14:07 G.m.t., the crew reported that the Remote Manipulator System (RMS) elbow camera was beginning to fade. This camera had functioned properly during EVA 1 and the first portion of EVA 2. The Orbiter had executed a plus x maneuver to allow retrieval of a free floating foot restraint approximately 25 minutes before the crew report of the camera failure. Review of video tapes indicates that the camera began to degrade immediately after the plus x maneuver.

Post-flight inspection of the lens assembly by the vendor indicated there was a loose retaining ring and a loose lens element in the lens assembly. This wide angle lens assembly was one of four flown. The entire lens assembly has been returned to the vendor for evaluation and determination of what caused the retaining ring to back off. A similar lens assmebly failure occurred on STS-8 but a different vendor was involved. A study is also underway to evaluate the loads induced into the elbow camera during on-orbit maneuvers. CONCLUSION: The RMS elbow television camera failed because a retaining ring loosened allowing a lens element to separate in the lens assembly, rendering the camera lens assembly inoperative. CORRECTIVE_ACTION: Evaluation by the vendor will determine corrective action and will be tracked on FIAR RCATVA2549F. A study of on-orbit vibration of the RMS camera position is in process. Data from that study will be used to assure that design criteria for the lens assembly adequately reflects actual flight conditions. The elbow camera lens assembly for STS-41C has flown successfully on a previous mission and will be installed with the cameras on the pad. FIAR ANALYSIS: Failed item is GFE to the Orbiter. Failure analysis and other references to the flight anomaly are contained in FIAR RCATV1364B01 and RCATV6848F. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** F-EMU-1364B-01 and 02	**IFA** STS-41B-V-21	CREW
	GMT: 38:17:21			**UA**	**Manager:**
			SPR	**PR**	
			IPR		**Engineer:**

Title: EMU Sublimator "Pressure High" Messages, Coupled With Low Crewman Work Rate. (GFE)

Summary: DISCUSSION: High EMU (extravehicular mobility unit) sublimator pressure alerted an EVA crewman on 5 occasions - once during EVA-1 for EMU-2 and twice during EVA-2 for both EMU-1 and EMU-2. Each occurrence was during a period of low metabolic activity caused by low crew activity. This resulted in the crewmen becoming "overcooled". Standard malfunction procedures, shutting off the sublimator cooling water flow, corrected the pressure each time.

Postflight examination revealed that particles of contamination small enough (less than 38 microns) to pass through the filter had lodged in the seats of the sublimator pressure regulators causing higher than normal regulator leakage. The regulators have been removed and replaced. The cleaning procedures for the EMU cooling subsystem will be revised to flush the system in various orientations. CONCLUSION: Contamination in the pressure regulators created a leakage resulting in high EMU sublimator pressure during periods of low crew metabolic activity. Shut off of H2O flow for these conditions is acceptable and is being baselined as a crew procedure. CORRECTIVE_ACTION: The contaminated regulators have been removed and have been replaced. The sublimator cooling water subsystem will be cleaned and inspected. This activity will be tracked by reliability data reports F-EMU-1364B-01 and 02. Inflight procedures have been changed to allow crewmen to shut off feedwater upon a high-pressure warning, and leave it off as long as deemed necessary. FIAR ANALYSIS: In all three instances of sublimator high pressure warnings SEM analysis has revealed particulate in excess of 25 microns imbedded in the sealing edge of the feedwater pressure regulator. Hardware changes will change the filtration levels and procedural changes have been implemented which will clean the filter after every usage. [not included in original problem report]
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-41B-V-22	CREW
	GMT:		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Extravehicular Activity Ancillary Equipment Problems. (GFE)

Summary: DISCUSSION: A. Foot restraints difficult to ingress. The EV-2 crewman boot toe was too big to easily fit under the toe bar. Extra toe padding had been added to the small boots for proper retention. Excess padding in the toe of the small boots will be removed. Small boots are not being used on STS-41C.

B. Slide wire linkage pip pin came out. One of the four slide wire pip pins came out on-orbit and was replaced by EV-1. A tie wrap will be added to all 4 pip pins on STS-41C and subsequent vehicles so that the T handle can not be pulled out until the tie has been cut. C. Foot restraint on SESA came free. EV-1 crewman recovered and replaced the foot restraint. Two additional wrist tethers have been added for STS-41C to retain the foot restraints on the CBSA (cargo bay storage assembly) and the FSSL (flight support station locker). After STS-41C, a new 12-point socket with a hex probe and a pip pin will replace the knob used for foot restraint retention and a tether will not be required. D. Secondary trunion pad attachment device (TPAD) control rod jammed and primary TPAD backed off during ratcheting. The crew used a wrench to rotate the rod on the secondary TPAD and primary TPAD jaw grip was tightened. Crew training and proper procedures will insure normal on-orbit operation of the control rods without interference. The jaw grip adjustment on the primary TPAD was tightened to a force near maximum specification similar to the force used on the secondary TPAD. E. Starboard MMU right hand lap belt on EMU difficult to install. A buildup of tolerances could make the lap belt hard to engage. The lap belt for STS-41 and subsequent flights has been redesigned with an automatic tension device for adjustment. CONCLUSION: See Above. CORRECTIVE_ACTION: See Above. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR EE0578F	IFA STS-41B-V-23	C&T
	GMT: 40:19:56		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Video Tape Recorder Creasing Tapes. (GFE)

Summary: DISCUSSION: At approximately 40:19:56 G.m.t., the crew reported that the VTR (video tape recorder), serial number 1002, had creased two pre-recorded tapes. The crew was advised to stop using the VTR and use the 16 mm DAC (data acquisition camera) for the remaining filming activities. At the crew debriefing, the crew reported that they inserted an unrecorded tape into the VTR the day following the creasing incident and the VTR performed nominally. Postflight inspections at JSC have shown no apparent problems with the VTR. Photographs of the cassettes as removed from the Orbiter show approximately 10 feet of unreeled tape in each cassette. Experience has shown that loosely wound tapes in cassettes will cause the VTR to jam and crease the tapes.

CONCLUSION: The VTR creased two pre-recorded tapes, but performed nominally with an unrecorded tape. The most probable cause was loosely wound tape in the pre-recorded cassettes that jammed the VTR and creased the tapes.   CORRECTIVE_ACTION: VTR serial number 1002 will be retested per the Acceptance Test Procedures, and VTR serial number 1005 has been installed in OV-099 for STS-41C. FIAR ANALYSIS: The Video Tape Recorder (VTR) and accompanying video tapes are GFE to the Orbiter. References to this flight anomaly are contained in FIAR EE-0578F. In this case it was felt that the tapes would unwind in zero-G (with orbiter vibrations) and be loose when inserted into the VTR. Flight crews are being instructed to wind the tapes tight before inserting them into the VTR. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-24	DPS
	GMT: 35:22:30		**SPR** 11F005	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: GPC-1 Benign Register Alteration Logged Wrong CRT 2 Input/Output Errors. (ORB)

Summary: DISCUSSION: At 035:22:30:48, 035:22:31:09, and 035:09:18 G.m.t., CRT (cathode ray tube) 2 was cycled to standby as a part of the crew preparation for the sleep period. While confirming that multiple I/O (input/output) fault messages correlated with the CRT 2 mode cycling, ground support also noticed a peculiarity in the response of GPC (general purpose computer)-1 to the inactive data bus associated with CRT 2. After extensive ground analysis and inflight troubleshooting mode selections by the crew, it was concluded that the observed GPC condition was benign and the nominal GPC entry configuration was maintained. The flight proceeded without further GPC-1 anomalies.

A G-MEM was developed for use prior to GPC-1 power down, postflight, to interrogate a suspect BCE (bus control element) register. KSC confirmed that the BCE register did have an anomalous value caused by a single "bit" being set to one in a high-order position. GPC-1 was removed, replaced, and returned to the vendor. The unit performed perfectly when powered up at the vendor. Circuit analysis, however, isolated the only plausible anomaly source to a RAM (random access memory) which was removed for detailed electronic and physical inspection. This is the first failure of this type that has been encountered. There is no evidence of any generic failure mechanism associated with the observed anomaly which would affect use of GPC's for subsequent missions.   CONCLUSION: The GPC-1 benign register alteration was caused by a single "bit" being set in the BCE register due to a faulty RAM semiconductor memory chip.   CORRECTIVE_ACTION: The RAM in the GPC-1 BCE register has been removed for failure analysis. The results of this activity will be tracked via CAR 11F005. CAR ANALYSIS: Analysis of the RAM did not disclose cause of problem. Failure could not be duplicated. It is not believed to be a generic problem and no further analysis will be conducted. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	**Time**	**Classification**	**Documentation**		**Subsystem**
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-25	C&T - S-Band
	GMT: 38:22:56		**SPR** 11F014	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Late Uplink Acquisitions With Tracking And Data Relay Satellite Using The S-Band Upper And Lower Right-Hand Antennas. (ORB)

Summary: DISCUSSION: Starting at about 038:22:56 G.m.t., a multitude of late uplink acquisitions occurred with the TDRSS (Tracking and Data Relay Satellite System) when using the S-Band right-hand antennas. The quality of the acquisition was very poor and frequently resulted in loss of lock for the first 20 minutes of the pass. Reacquisitions, as well as initial acquisitions, in many cases were established by manually switching the antenna beam switch.

The postflight data review revealed that the lower right-hand forward beam position indication had failed shortly before landing. Postflight troubleshooting at KSC revealed that intermittent acquisitions were occurring with the upper right-hand antenna. The lower right-hand antenna exhibited high reflected power. In addition, it was found that the lower right hand antenna assembly beam switch failed to transfer and failure of the forward beam position indication (tattle tale) was confirmed. Both the upper and the lower right-hand S-Band antennas have been removed, replaced and returned to the vendor for failure analysis.   CONCLUSION: The late TDRSS acquisitions and the losses of lock after TDRSS acquisition with the right-hand S-Band antennas were most probably caused by a failed antenna beam position coaxial switch. CORRECTIVE_ACTION: Both the upper and lower right-hand S-Band antennas have been removed, replaced, and returned to the vendor for failure analysis. The results of this action will be tracked via CAR 11F014. CAR ANALYSIS: Redesign of RF switches is in work. Antenna's have been determined as acceptable for limited utilization of 3 missions. [not included in original problem report]   EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	**Time**	**Classification**	**Documentation**		**Subsystem**
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-41B-V-26	APU
	GMT: Prelaunch		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: APU 2 Fuel Pump Valve System A Heater Failed. (ORB)

Summary: DISCUSSION: The APU (Auxiliary Propulsion Unit) 2 gas generator/fuel pump heater failed to cycle on system A during prelaunch cryogenic loading. APU 1 and APU 3 gas generator/fuel pump temperatures indicated that the heaters were cycling during this period. The APU 2 heater was then switched to system B and the heater cycled normally. The heaters for APU 2 remained on system B for the remainder of the mission.

Postflight testing of the APU 2 gas generator/fuel pump heater indicated normal operation. However, the test was conducted from the ground system through a ground support equipment interface that by-passed the heater thermostat. After installation of APU 2 for the STS-41C mission a heater verification test was performed from the crew cabin. The APU 2 gas generator/fuel pump heater thermostat failed to cycle to the on position. Troubleshooting of the anomaly revealed a broken wire in the heater control circuit. The wire has been repaired and the heater circuit verified for flight.   CONCLUSION: The APU 2 gas generator/fuel pump heater A failed to operate because of a broken wire in the heater control circuit.   CORRECTIVE_ACTION: The broken wire has been repaired and the heater circuit verified for flight.   EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-27	TPS
	GMT:		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: TPS Damage To Left OMS Pod And Nose Area. (ORB)

Summary: DISCUSSION: The left-hand OMS pod sustained severe tile and graphite epoxy structure damage during STS-41B. The damage source was ice which had formed around the potable and waste water dump nozzles which are located on the left-hand mid-fuselage sidewall approximately 110 inches aft and 30 inches below the center of the side hatch. The ice detached from the Orbiter and impacted the pod at approximately 1330 seconds after the start of entry, which is the time of maximum heating on the OMS pod. The velocity was approximately Mach 4.5 and the angle of attack was approximately 22.5 degrees.

The inner face sheet of the graphite epoxy honeycomb structure on the front of the left OMS pod was delaminated over a large area and requires replacement of the structure for the outboard nose panel. Other damage areas included glancing debris "hits" on the left-hand chine which caused shallow damage. One tile at the forward outboard corner and one tile at the aft outboard corner of the left-hand nose landing gear door had a chipped corner. Further, the forward tile was slightly slumped.   CONCLUSION: The left-hand OMS pod was damaged during entry by ice caused by on-orbit water dumps. The debris hits were probably caused by debris from the external tank. The forward tile slumping was caused by an out-of-tolerance gap.   CORRECTIVE_ACTION: For mission 41-C the OV-103 left-hand pod is installed on OV-099. This pod incorporates thick TPS tiles on the forward section. Test data indicates the thicker tile is approximately 6 times more resistant to impact damage than the tile which was flown on STS-41B. The right-hand pod TPS is the same as flown on the previous mission. For subsequent missions, the OV-099 on OV-102 OMS pods will incorporate, as a minimum, the OV-103 thick tiles on the forward section. For the debris damage and the slumped tiles, standard tile repair and replacement methods have been accomplished. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation	Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-41B-V-28	DPS
	GMT: 41:09:54		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Telemetry Format Load 161 Reject Not Detected By Software. (FSW)

Summary: DISCUSSION: At about 041:09:54 G.m.t., after on-orbit checkout of the flight control system using the PCMMU (Pulse Code Modulation Master Unit) TFL (Telemetry Format Load) 162, the crew attempted to re-load TFL 161 for continuance of on-orbit operations. Ground control observed from the down listed format ID (identification) that TFL 162 was still present in the PCMMU HDR (high data rate) format memory. The crew was advised to repeat the loading procedure, and TFL 161 was successfully loaded. There was no further impact to the mission.

Placing the PCMMU in a read-only, or "fixed" format prior to loading an HDR format, such as TFL 161, is a constraint inherent to the mechanization of the PCMMU and is called for in the flight procedures. Since the PCMMU will not load in "soft" format, it thus discarded the TFL 161 sent from the GPC (General Purpose Computer). A CMPT (complete), however, was displayed on the DU (Display Unit) SPEC 62 display. When the FSW (Flight Software) returned to the PCMMU and read the TFL 162 format in the PCMMU HDR memory if compared the TFL 162 check sum with the check sum of TFL 161 previously sent and ignored by the PCMMU. Since all TFL's have identical checksums (0000), there was no "FAIL" message initiated. The FSW is being reviewed to establish the best method of providing annunciation to the crew when a requested TFL fails to process in the PCMMU. There is no hardware problem. Since the problem is procedural and software related, and since ground control can detect an improper TFL load, the problem is manageable and there are no known safety issues for future flights. CONCLUSION: The TFL 161 reject by the PCMMU was caused by the PCMMU not being in "fixed" format. The current software does not annunciate a failure of the PCMMU to process a requested TFL. CORRECTIVE_ACTION: A software change request will be processed to provide a TFL fail-to-process indication to the crew should a procedural error recur. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation	Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-41B-V-29	MECH
	GMT:		SPR	UA	Manager:
			IPR	PR	
					Engineer:

Title: Right Outboard Brakes Damaged. (ORB)

Summary: DISCUSSION: Postflight inspection after STS-41B found 3 retainer washers broken or missing, carbon edges chipped on 23 brake lining segments and 18 drive clips peened or bent on the right outboard brakes.

Carbon liner edge chipping and retainer washer failures have occurred on the right main gear brakes for the last 4 flight. Brake/hydraulic dynamic interaction causes the carbon liner edges to chip allowing the carbon to wedge up under and fail the retainer washers. This dynamic interaction also causes the peening of the drive clips. Ground tests have been unable to to induce a similar dynamic response. Instrumentation will be added to OV-099, starting the flight after STS-41C, to better understand the brake/hydraulic dynamic interaction. An industry wide committee met at JSC in January, 1984, and reviewed the total brake design. They concluded that the Orbiter problems being experienced were not unusual and no safety issues existed. CONCLUSION: Brake/hydraulic dynamic interaction caused carbon liner edge chipping and subsequent retainer washer failures. Retainer washer failures have occurred on the right main gear brakes for the past 4 flight. This damage is not a safety issue. Hard braking was demonstrated on STS-6 (OV-099) as a DTO (development test objective). CORRECTIVE_ACTION: A comprehensive program plan for brake system improvement has been developed and is in evaluation. A detailed math model is being developed and carbon material characterization tests are in progress. Instrumentation will be added to OV-099 starting with flight after STS-41C to better understand the brake/hydraulic dynamic interaction. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE [the following was not part of the original problem report - see STS-41G-17] [DISCUSSION: Postflight inspection, removal and disassembly of the brakes revealed that three of the four brakes experienced damage. The beryllium was cracked on rotor 4 of the left inboard and both the right inboard and outboard brakes. Rotor 3 of the right outboard brake also had cracks in the beryllium. All three brakes had chipped carbon edges, scored linings, missing TZM washers and bent drive clip. Damage was very similar to that which occurred on STS-7 and STS-41C with OV-099. Analysis of the 49 channels of brake instrumentation added to OV-099 for STS-41G is expected to characterize the brake/hydraulic dynamic interaction. Data analysis is continuing to better understand the problem and to identify possible fixes to eliminate brake damage. CONCLUSION: Three of the four brakes were damaged during braking. The brake damage is not considered a safety issue. Hard braking was demonstrated on STS-6 (OV-099) as a development flight test objective. CORRECTIVE_ACTION: Data analysis is continuing to better understand the cause of the high dynamic loading during braking and to identify possible fixes to eliminate brake damage. CAR ANALYSIS: Some degree of brake damage occurs with nearly every mission. Several approaches have been put forward to redesign the brakes but only minor changes to the existing design have been approved. Damage to brakes does not represent a flight failure. Until proven corrective action is taken, the brakes will be new or refurbished to like new condition, incorporating all design changes approved to date and utilizing all new inspection criteria. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE]

Tracking No	**Time**	**Classification**		**Documentation**	**Subsystem**
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-30	GN&C
	GMT:		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Space Shuttle Main Engine-3 Ascent Thrust Vector Control Yaw Channel D By-passed. (ORB)

Summary: DISCUSSION: SSME (Space Shuttle Main Engine)-3 ATVC (ascent thrust vector control) yaw channel D was discovered in bypass after landing when the crew transitioned the GPC (general purpose computer) software from OPS-3 (entry) to OPS-9 (ground operations). Review of the flight data indicated a single channel failure and the bypass of SSME-3 yaw actuator channel D when the TVC (thrust vector control) isolation valves were operated to reposition the engines for entry. When the isolation valves were reopened after rollout, the channel remained bypassed and was not reset.

Similar failures on OV-099 have been detected during flight control single channel ramp tests in the OPF (Orbiter Processing Facility). These failures have been attributed to a change of servo-circuit filter elements prior to STS-6. Contamination (silt apparently collected on the outside surface of the filter elements) was inadvertently allowed to pass downstream of the filter into the servo circuit where it intermittently caused channel failures. De-silting procedures have been developed to clear these failures. KSC performed single channel ramp tests on all four channels three times. The actuator was then commanded to +8 degrees, -8 degrees and then to zero degrees and observed for secondary differential pressure force fights. A de-silting procedure using high ramp rates was then performed, followed by single channel ramp and actuator positioning retests. All four channels performed exactly to requirements. During flight, the bypassing of a single channel does not affect the actuator ram operation. A differential-pressure-sensing device activates an isolation driver which isolates and removed the defective servo valve hydraulic pressure, thus permitting the remaining channels and servo valves to control the actuator ram. A second failure would also isolate and remove the second servo valve hydraulic pressure, leaving two remaining channels. CONCLUSION: SSME-3 ATVC yaw channel D was bypassed during entry. This failure was most probably caused by accumulation of silt in the servo actuator system. CORRECTIVE_ACTION: De-silting procedures performed by KSC cleared the by-passed channel. Additionally, a de-silting confidence test will be performed per BLDG. 45 CHIT J1107 as late as possible in the STS-41C prelaunch flow. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-31	MPS
	GMT:		**SPR** 11F019	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Space Shuttle Main Engine 3 Helium Panel A Isolation Check Valve Leaked. (ORB)

Summary: DISCUSSION: During entry preparations, the SSME (Space Shuttle Main Engine) 1 and 3 helium systems are charged through the B legs of the SSME helium supply regulator. The SSME 3 helium regulator A leg outlet pressure rose 600 psi in 40 minutes. This pressure increase could have been caused by a leak from the A leg regulator outlet check valve (CV7) or from a A leg helium supply isolation valve (LV5). Calculations show the leak rate to be approximately 22 scim. A leak rate of this magnitude is not detrimental to SSME performance nor mission operations.

Postflight testing has confirmed that the helium system A leg check valve (CV7) had zero leakage while the helium system A leg isolation valve (LV5) had a leak rate of 27 scim. The helium system A leg isolation valve allowable leakage rate is 7.4 scim. A 27 scim leak rate equates to a decay of 0.23 lb per 24 hours. On orbit, the SSME 3 helium system had an average leak rate of 0.265 lb per 24 hours over the duration of the mission with the isolation valves closed. A system leakage rate of this magnitude will not impact the entry purge helium supply, although the allowable helium system loss is 0.24 lb per 24 hours. CONCLUSION: The SSME 3 helium leg A pressure increase was caused by leakage from the isolation valve and was not detrimental to SSME performance. Overall SSME helium system leakage will not impact the entry purge helium supply. CORRECTIVE_ACTION: NONE. The SSME 3 helium system leak rate will continue to be monitored. CAR ANALYSIS: Vendor failure analysis failed to duplicate the leakage experienced inflight. Teardown revealed minimal amounts of contamination and no wear. Valve will be refurbished and returned for service. No corrective action will be taken. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-32	MECH
	GMT:		**SPR** 11F015	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: All Four Tires On The Main Landing Gear Had A Flat Spot. ()

Summary: DISCUSSION: Each of the four MLG (main landing gear) tires had a flat spot where the tread rubber was worn through to the cord on the first of the 16-cord layers of the 34-ply rated tires. Both NLG (nose landing gear) tires were scuffed and the cord was visible in the scratches on one tire. Similar flat spots have been observed on the tires after previous concrete runway landings, but the wear did not penetrate through to the tread depth of the rubber. The severe wear in the flat spots on each tire after the first KSC (Kennedy Space Center) landing was probably caused by high tire-spin-up friction resulting from a combination of the lateral draining grooves cut crosswise into the runway and the rough longitudinal broom-finished surface of the concrete.

CONCLUSION: The flat spot on each of the four MLG tires and on both NLG tires was probably caused by high tire-spin-up friction due to the combination of lateral runway grooves and the rough longitudinal broom finish on the KSC concrete runway surface. Excessive tire wear is not a safety issue with the present crosswind constraint at KSC, but tire reuse is a cost and turnaround consideration. CORRECTIVE_ACTION: All four MLG tires and one nose wheel tire have been removed from service and replaced. The roughness in the landing area on the KSC concrete runway is being evaluated. CAR ANALYSIS: Flat spots caused by rough runway at KSC. No further action required. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-33	C&T - Ku-band
	GMT:		**SPR** 11F021	**UA**	**Manager:**

IPR **PR**

Engineer:

Title: Ku-Band Rendezvous Radar Failed Self-Test Intermittently And Would Not Acquir And Track Extravehicular Crewman-1. (ORB)

Summary: DISCUSSION: Prior to EVA (Extravehicular Activity) -1 at approximately 038:11:27 G.m.t. the Ku-Band system failed the self-test while operating in the RR (Rendezvous Radar) mode. The self-test was repeated and it was successful.

At 038:13:21 G.m.t., EV-1 (extravehicular crewman-1) started translation with the manned maneuvering unit during EVA-1. The RR mode was switched to GPC/ACQ (General Purpose Computer/Acquire) at 038:13:35 G.m.t., but the RR failed to acquire and track EV-1. EV-1 was tracked with the laser system using television cameras B and C. Later, at 038:15:24 G.m.t. during EVA-2, the RR successfully acquired and tracked EV-2. A postflight troubleshooting test sequence was performed at KSC, and the only malfunction uncovered during this test sequence was a failure to pass 1 out of 19 self-tests. A thorough review of the Ku-Band self-test sequence showed that the system timing accuracies are such that the failure to pass 1 out of 19 self-tests is not an abnormal condition. Evaluation of postflight test data, mission data and the radar portions of the Ku-Band have not identified any internal anomaly that could have caused the observed inflight problems. However, evaluation of the mission data did show that throughout the mission when the Ku-Band was in the radar mode, it was receiving random bursts of pulses of external radiation. Due to the mechanization of the radar portion of the system, the external energy confused the system self-test and contributed to the inability to acquire the EV crewman during the first EVA. Testing at the Ku-Band vendor has verified that external signals (pulsed, bursts, or continuous wave) can give the same Ku-Band signatures that were observed during the STS-41B mission. A thorough examination of Shuttle EMI (electromagnetic interference) test data has not identified any external source of radiation in the Ku-Band region. Data collection, and data and system evaluation will continue. In addition, possible external interference sources that could cause the problem will continue to be explored. The system will be flown as is on STS-41C based on the above evaluation and the fact that the RR acquired and tracked both the IRT (integrated rendezvous target) and the EV crewman during EVA-2 without any problems. CONCLUSION: The exact cause of the Ku-band failure to pass self-test is unknown. The most probable cause is external interference from some unidentified source. CORRECTIVE_ACTION: Evaluation will continue in an effort to determine the cause of the observed inflight anomaly. Also, possible external interference sources for the anomaly will be explored. The results of this activity will be tracked via CAR 11F021. CAR ANALYSIS: Duplication of the anomaly by Hughes was done with CW interference. There is no on-board equipment emitting this frequency. An outside source is suspected. High power ground radars were searching for 2 satellites lost during this mission. Action to find the cause is continuing. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-41B-V-34	EPD
	GMT: Postlanding		**SPR**	**UA**	**Manager:**
			IPR	**PR**	

Engineer:

Title: Payload Bay Door Right Aft-Bulkhead-Latch-Actuator Motor 2 Lost A Single Phase Of AC Power. (ORB)

Summary: DISCUSSION: During postflight payload-bay-door operations at KSC it was noticed that one of three AC bus 2 phases did not indicate a rise in current as was expected. Subsequent troubleshooting revealed a recessed pin in the mid-fuselage sill-longeron connector that supplies AC power to the right aft-bulkhead-latch-actuator motor 2. The pin has been repaired and three-phase operation of the motor has been verified in preparation for the STS-41C flight.

Postflight data review of the AC bus 2 currents indicate that the problem was present during the STS-41B on-orbit payload-bay-door operations. Loss of a single AC power phase cannot be discerned in terms of motor run times which have been used to detect a possible problem in the system. An OMRSD (Operational Maintenance Requirements and Specifications Document) change request will be processed to insure three-phase actuator motor operation prior to flight. AC power data will be reviewed during future flights to insure three-phase actuator motor operation of all payload-bay-door electro-mechanical devices. CONCLUSION: The payload-bay-door right-aft-bulkhead-latch-actuator motor 2 lost one phase of AC bus 2 power. The lose of power was caused by a recessed pin in the mid-fuselage-sill-longeron connector that supplies AC power to motor 2. CORRECTIVE_ACTION: The recessed pin in the AC power connector has been repaired and three-phase operation of the right-aft-bulkhead-latch-actuator motor 2 has been verified. An OMRSD change request will be processed to insure AC power three-phase actuator motor operation prior to flight. To assure early problem detection, the AC power data will be evaluated during flight to determine proper operation of all payload-bay-door electro-mechanical devices. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41B-V-35	RCS
	GMT: 42:05:27		**SPR** 11F022	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Forward Reaction Control System Fuel And Oxidizer 3, 4 And 5 Tank Isolation Valve Status Loss. (ORB)

Summary: DISCUSSION: At 042:05:27:36 G.m.t., an unexplained load occurred on all three phases of the AC1 power bus. At the same time, operate status bits 1 and 4 of the forward motor-control assembly 1 indicated "operate". The three-position FRCS (forward reaction control system) tank isolation 3, 4, and 5 switch was in the open position. The open-switch position, coupled with a loss of the isolation-valve-open talkback discrete, caused an output to the relay switches that drove the valves against the open stops for approximately 6 seconds. After the 6-second interval, the AC1 bus load cleared and remained normal for the rest of the mission.

Postflight testing verified proper operation of the valves and the talkback in one g. The talkback discrete dropout may have been caused by a contaminated switch assembly in zero g or an intermittent short in the Orbiter electrical system. If the problem was caused by contamination in one of the position switches shorting the open indication to ground, the potential exists that the same contamination could cause the problem to recur. This would result in a false indication of valve position and cause the valve to drive to the open position. If the valve were closed, contamination could get in the switch and cause the valve not to open. The valve is only closed during servicing or in case of two leaks. If the failure was caused by an intermittent shor in the Orbiter wiring, the valves would be driven to the open position. The valves are always in the open position during the mission unless a thruster-leak occurs and a manifold isolation valve fails to close. If this anomaly recurs, either in STS-41C prelaunch checkout or in flight, the valve position switch will be placed in GPC (General Purpose Computer) position to remove power from the valves. Should this anomaly occur during loss-of-signal, a thermal overload protects the valve motors from damage. CONCLUSION: The talkback discrete dropout was most probably caused by a contaminated switch assembly. An intermittent short in the Orbiter electrical system is also a possibility. CORRECTIVE_ACTION: The valves will be cycled again during prelaunch checkout for STS-41C. If the problem recurs, the valve switch will be placed in the GPC position, removing power from the valves. Troubleshooting will be accomplished after STS-41C to determine the cause of the problem. Ananlysis and corrective action will be tracked on CAR 11F022. CAR ANALYSIS: Now transferred to 13F001-010. New limit switches are being designed for the AC motor valves. Not an actuator problem. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE